

Health Impact Assessment

Proposed Concentrated Animal Feeding Operation in Wicomico County

A Health Impact Assessment detailing the potential impact of a proposed concentrated poultry operation.

April 2016



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TABLE OF CONTENTS

| | |
|--|----|
| Contributors | 3 |
| Executive Summary | |
| Relevant Questions | 4 |
| Conclusions | |
| Recommendations | |
| Introduction | 5 |
| Screening | 8 |
| Scoping the HIA Framework | 12 |
| Assessment | 15 |
| Recommendations | 21 |
| Reporting | 23 |
| Monitoring and Evaluation | 24 |
| References | 25 |
| Attachments | |
| Letter From Johns Hopkins, Center for a Livable Future | 26 |
| Executive Culver Statement on Results of Poultry Forum | 36 |
| Appendices | |
| 2013 Maryland Asthma Emergency Department Visits | |
| 2013 Wicomico Asthma Emergency Department Visits | 39 |
| 2009 Wicomico All-Cause Mortality | |

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EXECUTIVE SUMMARY

Concentrated animal feeding operations (CAFOs) have received a substantial amount of media attention in Wicomico County. The Wicomico County Health Department reviewed numerous data sources related to CAFOs and environmental studies.

RELEVANT QUESTIONS

Is there a relationship between CAFO emissions and the increase in asthma triggers?

What is the potential for an increase in nitrates and other contaminants in the Paleochannel?

Even with proper manure management, is there a significant public health risk associated with an increase in insect vectors?

A large volume of research and case studies have supported potential negative effects of CAFOs on the neighboring community. However, this generalization cannot be projected across all CAFO types since few studies provided data relevant to poultry CAFOs. In conclusion, there is little direct evidence that the proposed project will affect the public health or the environment in the community.

The Health Department provides these recommendations in an attempt to mitigate the activities related to poultry CAFOs:

KEY POLICY RECOMMENDATIONS

RECOMMENDATION 1: Adopt legislation adding setback and buffer requirements consistent with the Delmarva Poultry Industry's Best Management Practices for Good Neighbor Relations.

RECOMMENDATION 2: Increase communication with poultry integrator and involve them early in the application and permitting process.

RECOMMENDATION 3: Reduce potential impacts from odors by properly implementing a manure management plan.

RECOMMENDATION 4: Increase funding for data collection, analysis, education, and outreach related to respiratory disease and illness.

INTRODUCTION

This health impact assessment (HIA) examines some of the most significant potential health impacts from a proposed concentrated animal feeding operation (CAFO) in Wicomico County, MD. Specifically, this assessment will examine a proposed poultry operation consisting of 10 poultry houses (original proposal was 13 and later reduced to 10 in February 2016) at the northwest intersection of Naylor Mill and West Road. The proposed location is less than 1 mile from the corporate limits of the City of Salisbury, the county seat of Wicomico County.

HIAs focus on how health determinants resulting from a policy or plan could affect long term health outcomes and health disparities. Health outcomes are changes in the health status of an individual, group or population, which are attributable to a planned intervention or series of interventions (as opposed to incidental exposure to risk), regardless of whether such an intervention was intended to change health status¹. HIAs provide both quantitative and qualitative forecasts of potential impacts based on relevant research, data and expert opinions. In this case, understanding the health impacts of the best management practices of poultry farms is useful in developing recommendations. The primary goal of this HIA is to engage and inform the community and potential legislative decision-makers on how, if at all, CAFOs are linked to individual and community health outcomes. This HIA seeks to review existing research and data in such a way that it best informs policy, programmatic or legislative decisions.

A HEALTH IMPACT ASSESSMENT is a combination of procedures, methods, and tools by which a policy or project may be judged as to its potential effects on the health of a population, and distribution of those effects within the population. HIA provides recommendations on monitoring and managing those effects.

–World Health Organization

Wicomico County is 2nd in the State of Maryland in agricultural production, with an annual market value of over \$236,000,000. The County ranks 4th in the State in commercial broiler poultry production and 2nd for vegetable production². These farms contain nearly 84,000 acres, with an average size of 164 acres each. Agriculture is embedded into the community and is a staple of the local economy. The County's Right to Farm Act states: *"to reduce the loss to the county of its agricultural resources by limiting the circumstances under which agricultural operations may be deemed to constitute a nuisance, trespass or other interference with the reasonable use and enjoyment of land, including, but not limited to, smoke, odors, flies, dust, noise, chemicals or vibration, provided that nothing in*

this chapter shall, in any way, restrict or impede the authority of the state and of the county to protect the public health, safety and welfare, nor shall it restrict or impede private covenants³.”

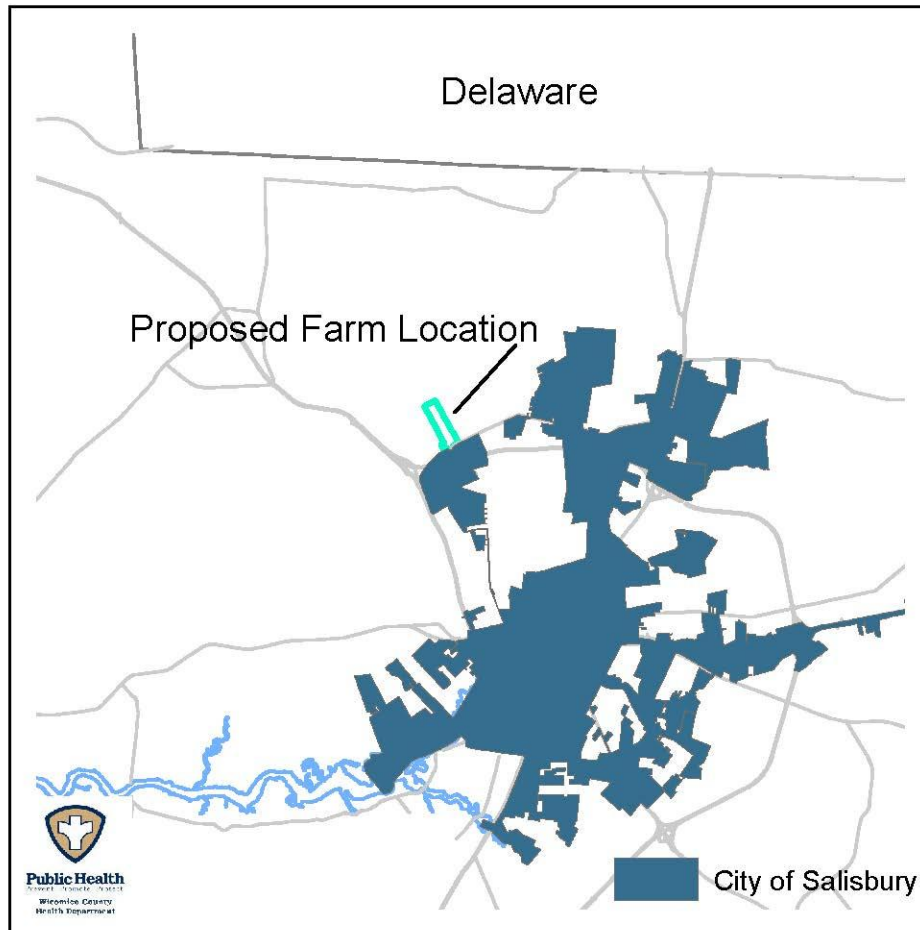


Figure 1: Proposed CAFO location.

When properly managed, located, and monitored, poultry CAFOs can provide a low-cost source of meat and eggs, due to efficient feeding and housing of animals and increased facility size⁴.

| | Large CAFO | Medium CAFO | Small CAFO |
|--------------------------|-----------------|------------------|------------------|
| Chickens (Dry Manure) | 125,000 or more | 37,500 – 124,999 | Less than 37,500 |

Regulatory definition of a poultry concentrated animal feeding operation.
Maryland Department of the Environment.

The Maryland Department of the Environment requires a number of permits in order for a CAFO to operate. Additional requirements include nutrient management plans from the Department of Agriculture. These plans address bird mortality and how the farmer is to handle the disposal of bird carcasses.

The following permits are required from MDE before construction can begin:

- General Permit for Stormwater Associated with Construction Activity
- Erosion and Sediment Control Plan
- Stormwater Management Plan
- Waterway Construction Permit (if located within the 100-year non-tidal floodplain)
- Water Supply Appropriation Permit

Once approved to operate, CAFOs become registered for a 5 year period. Inspections are conducted as issues or complaints arise. Annual Implementation Reports are required by the Departments of Agriculture and Environment. These self-reporting tools allow the CAFO operator to report on annual activity related to the poultry operations.

SCREENING

STEPS IN THE HIA PROCESS

1. **SCREENING** determines the need for and value of an HIA.
2. **SCOPING** develops a plan and timeline for the HIA that defines research questions, health outcomes and vulnerable populations.
3. **ASSESSMENT** involves using existing data, expertise and experience to profile existing conditions, evaluate the direction and magnitude of potential health impacts, and make policy recommendations.
4. **RECOMMENDATIONS** advocate in the most effective way possible actions that will improve health outcomes of the policy.
5. **REPORTING** communicates the HIA findings and recommendations.
6. **MONITORING AND EVALUATION** tracks the impact of the HIA on the decision making process.

A Health Impact Assessment was conducted to determine what potential health outcomes may exist from the proposed poultry operation. This HIA involved community stakeholder involvement through several types of public meetings, including the Wicomico County Council legislative sessions. Some of the groups represented included: Circle of Leaders, Assateague Coastal Trust, Backbone Community Group of Somerset County, Westside Homeowners Association, and the Johns Hopkins University's Center for a Livable Future.

Initially, the Wicomico County Health Department met with community stakeholders in January 2016. This meeting was requested after the community learned of the proposed poultry operation. A letter from the Johns Hopkins University's Center for a Livable Future was provided. This letter contained research related to CAFOs. While the Department doesn't play a role in the regulatory process of CAFOs, it agreed to review the research that was provided and conduct our own review of additional data sources. Since this poultry farm was proposed, it has received increased media attention.

Headlines such as "Paleochannel is Citizen Group's Main Concern", "Wicomico Group Want to Block Chicken Operation", and "Poultry Farm Foes Take Concern Back to County" have described the opposition to the proposal.

On March 22, 2016, the County Executive hosted a public forum to address concerns that were brought up at numerous County Council meetings. The meeting was moderated by Greg Bassett, Editor & General Manager of the Salisbury Independent. Questions were developed prior to the meeting based on the comments and feedback received during previous stakeholder involvement. Additional questions were gathered from the audience in written format during the meeting. Approximately 600 people

attended the meeting. The panel included nine experts from the State agencies that are either directly involved in the CAFO permitting process or have experience in environmental public health:

- Harry Hunsicker, Compliance Program, Eastern Division Chief, Water Management Administration, Maryland Department of the Environment (MDE)
- Otto Schlicht, District Manager of Eastern Shore Regional District, MDE
- John Grace, Chief, Source Water Protection and Appropriations Division, MDE
- Hussain Alhija, Program Manager for the Resource Management Program, MDE
- Gary Kelman, Chief, Animal Feeding Operation Program Manager, MDE
- Hillary Miller, Acting Director of Land Management Administration, MDE
- Clifford Mitchell, Director of Environmental Health Bureau, Department of Health and Mental Hygiene
- Dave Mister, Eastern Shore Regional Coordinator, Maryland Department of Agriculture
- Steve Dawson, Eastern Shore Region Chief, Non-Tidal Wetland Division, MDE



March 22, 2016. Panel of speakers. (l to r, see above). County Executive Bob Culver at podium.

Topics discussed at the forum included: cancer clusters, nitrate levels in the Paleochannel, the risk of additional nutrients from poultry CAFOs, asthma triggers, and permitting of CAFOs. General zoning concerns were not addressed in this forum and will be discussed at future County Council open work sessions.

SCOPING THE HIA FRAMEWORK

The geographic area included in this HIA is north-northwest of the City of Salisbury, MD. Vulnerable populations potentially affected by this proposed poultry operation include public school children, low-income children, low-income communities and children from specific ethnic or racial groups. Other affected populations may include community farmers, metropolitan communities and non-metropolitan communities. The area is identified as Census Tract 102 (2010 United States Census). General population characteristics of the tract are detailed below:

| Subject | Number | Percent |
|---------------------------|--------|---------|
| Total Population | 6,142 | 100% |
| Male | 2,730 | 44.4% |
| Female | 3,412 | 55.6% |
| Race | | |
| White | 896 | 14.6% |
| Black or African American | 4,937 | 80.4% |
| Other | 309 | 5.0% |

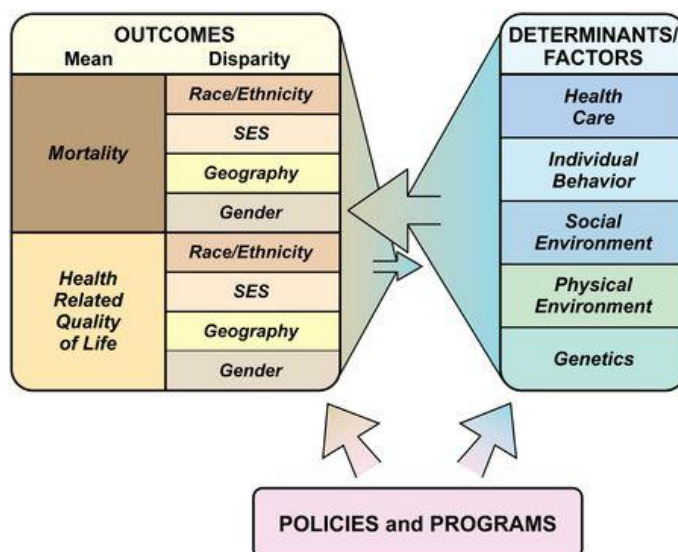
Although there is evidence that CAFOs may impact property values, this HIA will not address those concerns. Instead, we will assess the potential health determinants and outcomes that may affect the neighboring community. While it is clear that an increase in vehicle traffic and odor can be expected, it is not clearly understood how the proposed operation may impact public health, specifically through:

- Air quality
- Groundwater quality
- Insect vectors

Additionally, cancer clusters related to CAFOs have been discussed in several public forums. Agricultural workers in general appear to have elevated rates for several types of cancer⁵. No specific patterns of exposures have been attributed to the increase. However, exposure to vehicle exhaust, pesticides, VOCs, or other chemicals may be contributing factors⁵. There have been no identified cancer clusters nationally that can be linked to CAFOs.

This HIA will consider these pathways as they appear to be important from a public health perspective and have been raised distinctly by stakeholders. We will review the severity of the health effect, the size and likelihood of the effect, and the potential of the effect to exacerbate health disparities. It is important to note that while there is substantial data on health outcomes on a County and State level, there is little data available on a smaller scale such as neighborhoods or census tracts.

| Health Determinant & Pathway | Potential Health Impact | Vulnerable Populations |
|---|--|---|
| Air quality: Potential increase in airborne particulate matter and ammonia | Increase in asthma triggers | People with heart or lung diseases, children and older adults |
| Groundwater quality: Potential increase in nutrients | Increase in nitrates, methemoglobinemia. | Infants <6 months of age |
| Insect vectors: Potential increase in the presence of flies | Transmission of pathogens | Neighboring residences |



Health determinants. Graphic courtesy of University of Wisconsin: Improving Population Health.

Air Quality

Concentrated animal feeding operations have the ability to contribute to the reduction of air quality in areas surrounding the farms. Research indicates the gaseous emissions of CAFOs can increase greenhouse gases, such as methane. However, this HIA will focus on the potential health impacts related to CAFO emissions and their relationship to asthma triggers. These triggers may include particulate matter (dust) and ammonia.

Groundwater Quality

Typically, water pollution from CAFOs results from the improper application of manure onto agricultural fields or the failure of manure storage lagoons. These issues have been observed to have an acute and immediate effect on surface waters. This assessment of

the proposed poultry CAFO will focus on the potential long term impacts on the Paleochannel.

Insect Vectors

Manure from CAFOs can be a breeding ground for insects and the pathogens that they may carry. This HIA will research existing literature to provide recommendations on strategies to mitigate the potential increase in insects.

Stakeholders were engaged during the HIA process through several methods. The Health Department met with several organizations. Comments from the Wicomico County Council meetings were reviewed from February 2, February 16, and March 1. A public forum was held by the County Executive's office on March 22. Concerns raised during this meeting were also incorporated into this assessment.

Based on the stakeholder input, the Department formulated the following questions that this HIA will address:

| Health Determinant | General Research Question |
|---------------------|--|
| Air quality | Is there a relationship between CAFO emissions and the increase in asthma triggers? |
| Groundwater quality | What is the potential for an increase in nitrates and other contaminants in the Paleochannel? |
| Insect vectors | Even with proper manure management, is there a significant public health risk associated with an increase in insect vectors? |

ASSESSMENT

This HIA employed a mix of research methods, including a review of existing literature and secondary data analysis. In addition, we examined reference lists, review articles, and related author publication lists for eligible articles. Many articles had findings related to multiple health determinants relevant only to swine and livestock CAFOs. Currently, there are no existing animal operations similar in size in the County that could provide additional data.

Statistics of population-health at the national, state, and local levels are readily available. However, few data sources are available on the geographic scale addressed in this HIA. In addition, health impacts and disease rates in small populations can vary substantially, and it may not be possible to evaluate them dependably.

HIA RESEARCH & ASSESSMENT METHODS

- 1. Literature Review:** Review of literature on health determinants and pathways.
- 2. Secondary Data Analysis:** Summary of existing data related to populations and health impacts.
- 3. Stakeholder Input:** A community forum was conducted to gather input.

Air Quality

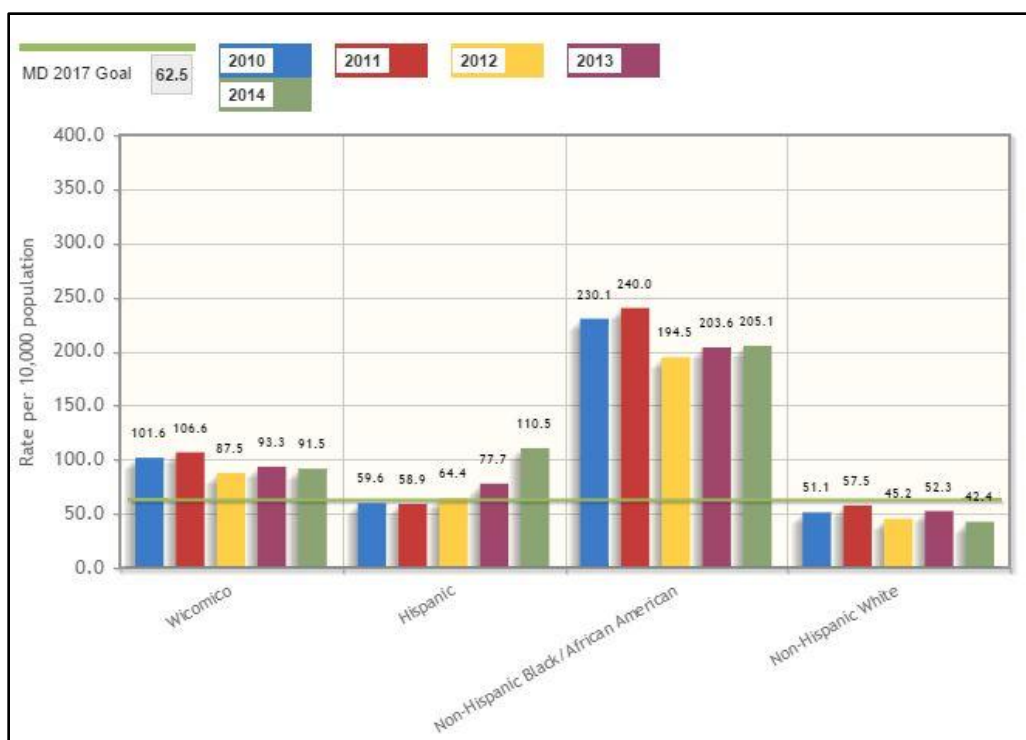
Particulate matter is defined as a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including organic chemicals, metals, and soil or dust particles⁶. People with heart or lung diseases, children and older adults are the most likely to be affected by particle pollution exposure.

Ammonia is a colorless gas with a distinct odor. It is naturally produced by microorganisms in manure. It is the main component in the odors

associated with poultry CAFOs. Exposure to high levels of ammonia can cause irritation to the nose, throat, and lungs resulting in coughing, burning sensations, and other discomfort. Asthmatics are usually more sensitive to ammonia than others.

Poultry CAFOs are known to produce odors, especially when the manure is removed from the houses. Studies indicate that these odors play a role in mood disturbances and health problems related to the perception that the air is unhealthy⁷.

In 2014, Wicomico County had a 69% higher rate of emergency department visits due to asthma per 10,000 population than the State of Maryland⁸. Children represent a particularly sensitive population. According to a 2010 report from the Maryland Governor's Office for Children, 24.5% of Wicomico County children in middle school had ever been diagnosed with asthma. That rate is slightly higher than the State average of 19.9%. (See Appendices for additional data).



2010-2014 Wicomico County emergency department visit rates due to asthma.

The literature review conducted by this HIA found a correlation between a large swine CAFO and an increase in the prevalence of physician-diagnosed asthma among students and a school in Iowa⁹. Research does not provide a clear understanding on how poultry-based CAFOs impact the community's health. There is little correlation between the health impacts of livestock CAFOs and those that may originate from poultry CAFOs. Additionally, it is difficult to infer the effects found in farm workers can be found in neighboring residents. Air pollutants and odors are usually very dilute by the time they reach nearby homes, and to date there are few studies available that specifically address CAFO emissions and respiratory illnesses in neighboring residents⁷.

According to the Center for Disease Control and Prevention's (CDC) National Environmental Public Health Tracking Network, the most recently (2011) recorded annual level of particulate matter (PM_{2.5}) in Wicomico County was 9.3 micrograms per cubic meter (µg/m³). During that same period, the Maryland annual level was higher, at 12.0 µg/m³⁽⁶⁾.

Data from a handful of studies suggest that CAFO emissions can cause an increase in self-reported respiratory symptoms such as wheezing, headache, etc... To date, however, emissions have not been associated with increases in measurable respiratory illnesses⁷.

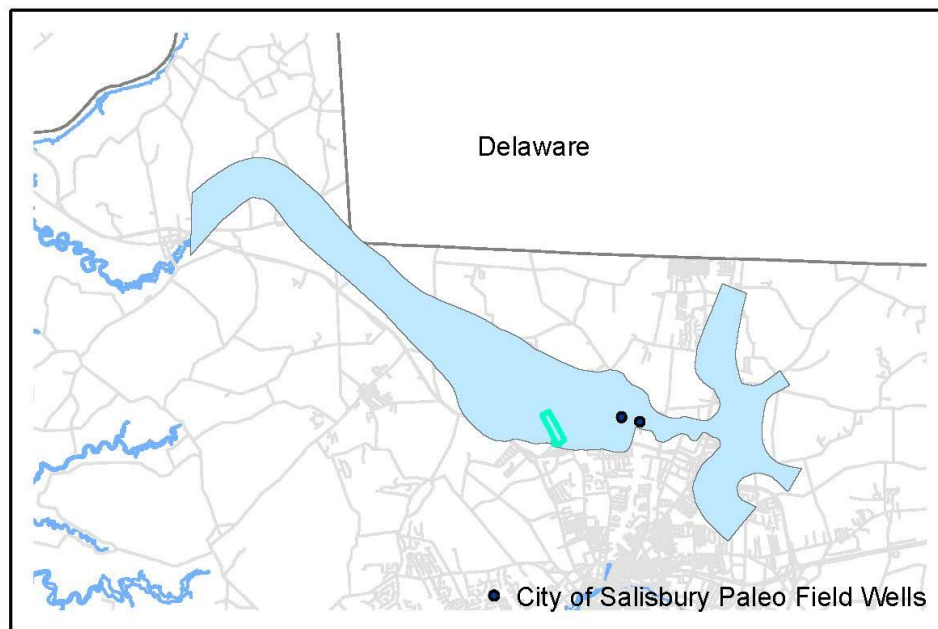
In conclusion, it is certain that CAFO emissions including ammonia and particulate matter can have detrimental effects on those who work inside the confined buildings. Whether those same effects appear in neighboring residents where emissions are diluted, is unclear. Actual concentrations of contaminants detected at surrounding residences were much lower than those known to impact human health⁷. Tree and shrub buffers can

absorb ammonia and reduce the flow of particulate matter¹¹. It is recommended that setbacks and vegetative buffers be added to the Wicomico County Zoning Code.

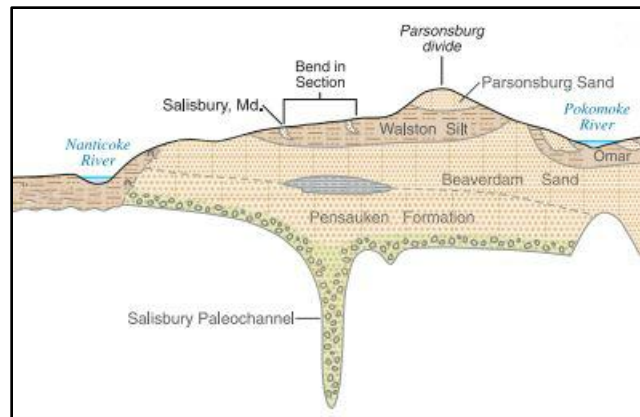
Current studies and available data are limited in the association of air quality and the impact on the health of the surrounding community. Additional data is needed to study the impact CAFOs may have on the air quality in surrounding areas.

Groundwater Quality

In communicating with stakeholders, a common theme related to this proposal was the protection of the Paleochannel from contamination. The Paleochannel is a depression in the surficial aquifer. This depression allows water from the shallow Columbia Aquifer to mix with the confined Manokin Aquifer (Figure 5). Its depth ranges from the surface to 230'. The aquifer is characterized as having a high transmissivity rate of approximately 53,500 ft²/day^{12, 13}. It serves as the primary water source for a large number of individual water supply systems. The City of Salisbury has 2 water supply wells that are located in the Paleochannel.



Paleochannel.

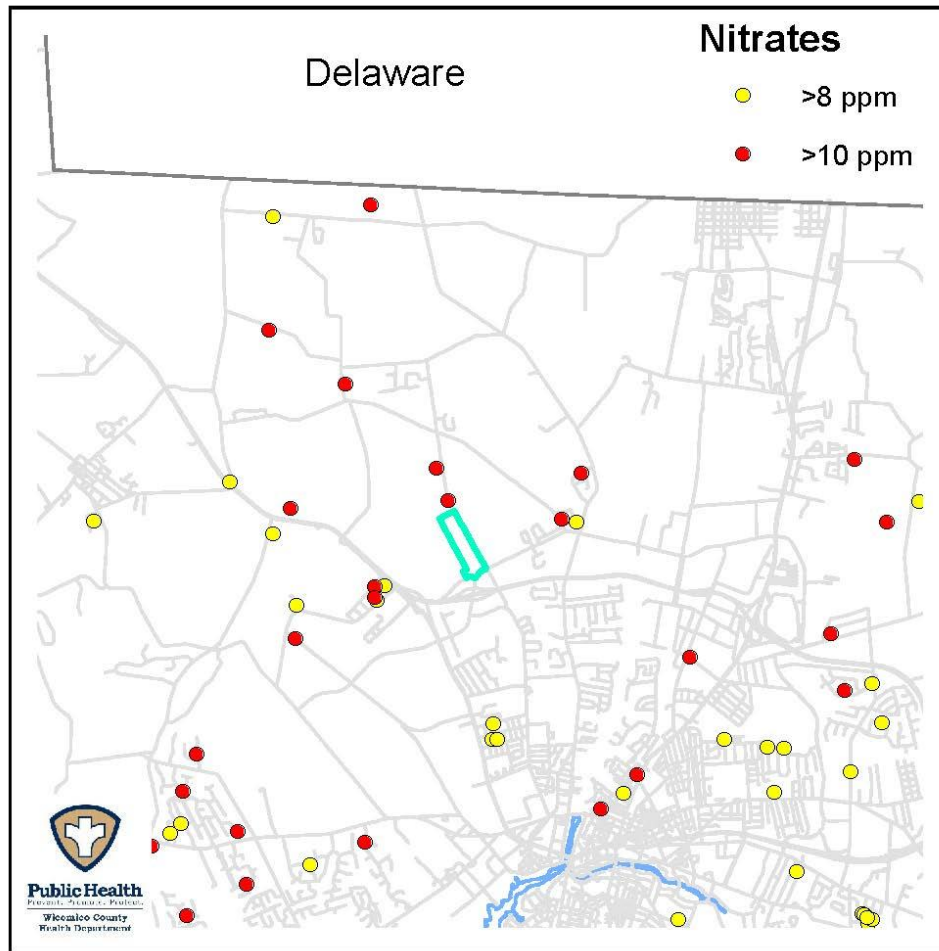


Cross section of the Paleochannel¹³.

Due to the fact that the Paleochannel is unconfined and characterized with high transmissivity, it is vulnerable to contamination from both point and non-point sources. Although in 2013, Advanced Land & Water, Inc. specifically stated that “the Paleo well field is not presently susceptible to nitrate contamination”¹⁵.

Existing water sample data indicate that there are currently high levels of nitrates in the shallow surficial aquifer. Agricultural production and on-site sewage disposal systems are likely contributing factors. Figure 6 displays well locations that are known to have nitrates approaching or above the maximum contaminant level of 10 parts per million (ppm). There is no known pattern to the distribution of these high nitrates, as they can be observed in the surficial aquifer countywide.

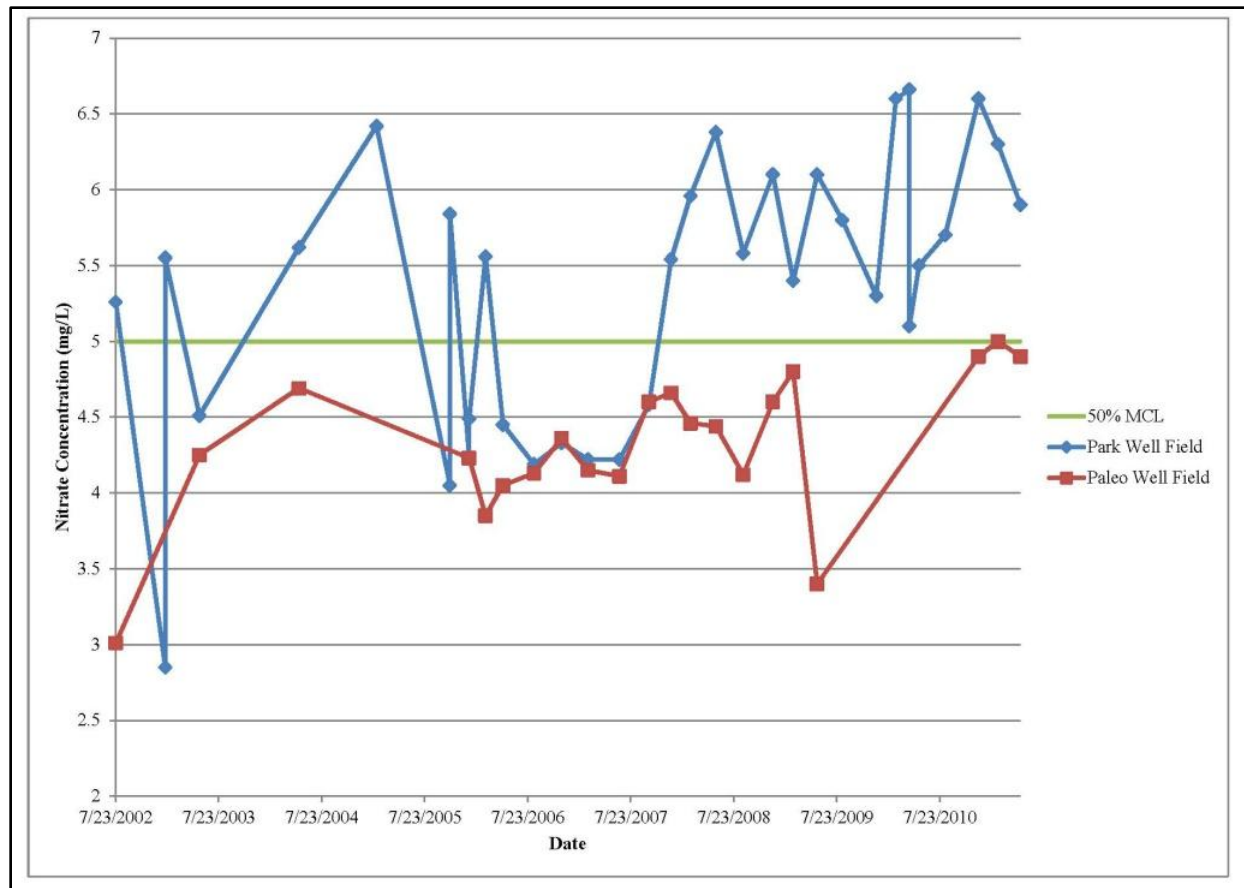
According to the 2011 Maryland Department of the Environment’s Phase I Watershed Implementation Plan, CAFOs produce 10,813 pounds of nitrogen per year (lbs/year). This pales in comparison to the contributions from septic systems and forested areas at 154,473 lbs/year and 304,789 lbs/year, respectively.



Locations of high nitrate wells (2008-2015).

Historical trends favor an increase in the overall nitrate concentration detected in the surficial aquifer (Figure 7); however, it is uncertain if this trend will continue since the advent of a number of initiatives. These include nutrient management plans, total maximum daily loads (TMDL's), and programs related to the reduction of nutrients from septic systems.

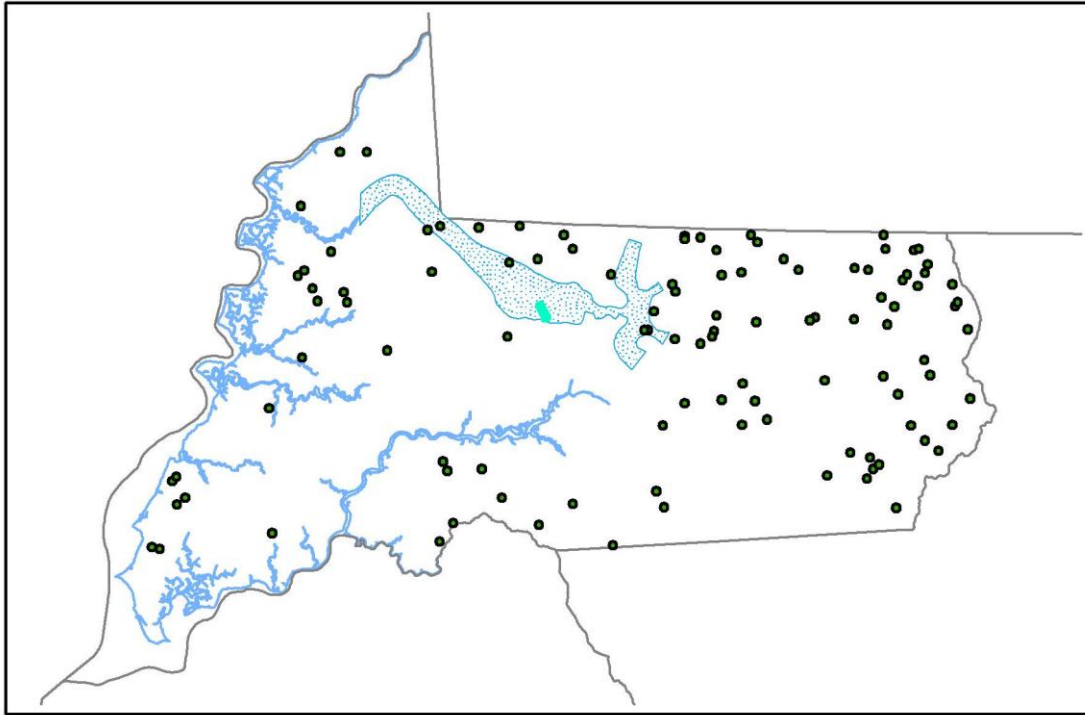
This proposed project will not use the manure it produces. Instead, it will be stored under the cover of a manure shed and used offsite. Ground and surface water contamination mentioned in research is typically associated with the failure of manure storage lagoons commonly used in swine or livestock operations. It is nearly impossible to make a determination on how this proposed CAFO will affect nitrates in the future. With successful management of the manure produced, there is little to no risk that this project will contribute to an increase in nitrates any more than using the property as traditional crop production.



Historical nitrate results from the Salisbury Paleo well field¹⁴.

At the time of this publication, there were 110 poultry CAFOs permitted by the Maryland Department of the Environment in Wicomico County, including 4 within the Paleochannel Overlay District. This HIA did not identify any correlation between the locations of these CAFOs and wells with high nitrates.

During the March 22, 2016 public forum, Mr. John Grace, Chief of the Source Protection and Appropriations Division for MDE, stated that long term water levels in Paleochannel remain relatively unchanged. He added: the volume of water withdrawn for agricultural crop production is a magnitude higher than the volume withdrawn for poultry operations.



Permitted poultry CAFOs.

Insect Vectors

CAFO operations and the waste that they produce can provide breeding grounds for insects. Research conducted during this HIA found that the residences closest to the proposed poultry operation may experience an increase in fly population. It is unclear as to what distance the increase can be attributed to. Although flies have been implicated in carrying a number of organisms that may cause illness or disease, no evidence exists that they have caused outbreaks of any human or animal illness¹⁶. This HIA did not identify any potential risk from insect vectors to the community's public health. The potential increase in flies can be mitigated if the CAFO is properly maintained and operated by a responsible party. Identifying problems in the future will rely solely on the observations of neighboring residents. It is recommended that the County begin discussions with the poultry integrator early in the application and permitting process.

Mosquitoes have also been known to proliferate in CAFOs. While this proposed project does not include a manure lagoon, mosquitoes can still reproduce in standing water. Proper maintenance of the storm water system should help to reduce standing water.

RECOMMENDATIONS

This Health Impact Assessment reviewed a large volume of data and research related to the potential health impacts of concentrated animal feeding operations on the neighboring community. Based on the available data, this HIA makes the following recommendations:

RECOMMENDATION 1: Adopt legislation adding setback and buffer requirements consistent with the Delmarva Poultry Industry's Best Management Practices for Good Neighbor Relations.

The Delmarva Poultry Industry has been an important component of the agricultural community for more than 90 years. In 2015 it revised its Best Management Practices for Good Neighbor Relations. In this document, voluntary practices are offered to farmers as measures to improve relationships with neighbors. Recommended setbacks for new poultry houses and accessory structures include:

- 400' from a residential dwelling not located on the farm,
- 200' from the centerline of any road, with the installation of a 25' wide vegetative buffer, and
- 100' from a property line.

It is recommended that Wicomico County adopt these setbacks with additional requirements for vegetative buffers and earth berms. These will assist with screening and odor control.

RECOMMENDATION 2: Increase communication with poultry integrator and involve them early in the application and permitting process.

Early involvement with the poultry integrator may eliminate communication issues and the dissemination of fictitious information. Responsible integrators can ensure that manure management plans are followed, reducing complaints from neighboring residents.

RECOMMENDATION 3: Reduce potential impacts from odors by properly implementing a manure management plan.

Historically, nutrient management plans have not been disseminated or discussed during the application process. Adding a local review of the manure management and schedule will allow County officials to address community concerns that may be related to odor and other potential impacts. Ensuring the community is aware of the Agricultural Reconciliation Committee and its purpose should assist the County in addressing complaints.

RECOMMENDATION 4: Increase funding for data collection, analysis, education, and outreach related to respiratory disease and illness.

This assessment clearly identified the need for additional air quality data. While current studies and available data are limited in the association of air quality and the impact on the health of the surrounding community, additional data is needed to study the impact CAFOs may have on the air quality. Increased surveillance and funding for respiratory illness education and outreach specific to vulnerable populations are needed. This assessment encourages future studies aimed to collect data on the emissions from existing CAFOs and how they may impact the air quality in surrounding communities.

REPORTING

This HIA will be provided to the Wicomico County Executive's office. It is expected that they will use this as just one tool in considering the impact of CAFOs on the community.

The proposed CAFO's location is expected to minimally impact a few small communities located closest to the project. Smaller subdivisions include Fox Meadows (22 dwellings) and Bennett Mobile Home Park (37 occupied mobile homes). These residents were very active in the discussions at County Council meetings and the March 22nd open forum.

A number of data sources were used in preparing this assessment. Asthma data from the Maryland State Health Improvement Process and the CDC are shown in previous sections.

The Health Department engaged stakeholders in the screening process to identify which specific health determinants could impact the communities surrounding this proposed CAFO. On April 5, 2016, the Health Department met with stakeholders from the Circle of Leaders, Assateague Coastal Trust, Moms Across America, and the Concerned Citizens Against CAFOs. The data sources, additional literature, and the findings of this assessment were discussed. Gaps in available air quality data were also discussed.

MONITORING AND EVALUATION

The Wicomico County Health Department will monitor the impact of this HIA on the County legislation, as well as the impact on other debated CAFOs. Monitoring will include the tracking of websites, news stories, magazine articles and the legislative process. Complaints related to CAFOs should also be tracked by engaging Wicomico County Planning, Zoning and Community Development, as well as the County's Agricultural Reconciliation Committee.

The Health Department will continue to monitor water quality countywide, including areas within the Paleochannel. Trends related nitrate concentrations will be monitored through water sampling processes. Additionally, the Department will continue to monitor the amount of asthma identified in local communities. Difficulty remains in specific locations of those cases, as data is mostly limited to zip codes.

The April 5, 2016 Health Department and stakeholder meeting identified gaps in available air quality data. Two proposed research projects were discussed in an attempt to eliminate the missing data gap:

- Capturing baseline air quality at schools.
- Studying the emissions of poultry houses.

Both of these projects have the ability to assist decision makers in understanding the existing air quality in our County, as well as identify what, if any, impacts may exist from CAFO emissions.

Ongoing evaluation of this assessment will continue in hopes of identifying additional data sources and research relevant to poultry CAFOs. Future assessments may provide relevant information on impacts to surrounding communities.

REFERENCES

1. <http://www.who.int/hia/en/>. Accessed February 17, 2016.
2. <http://extension.umd.edu/wicomico-county/agriculture-wicomico-county>. Accessed February, 16, 2016.
3. Wicomico County Code §186 - 1(A).
4. Understanding Concentrated Animal Feeding Operations and Their Impact on Communities. National Association of Local Boards of Health (NALBOH) 2010.
5. Agricultural Exposures and Cancer, Aaron Blair and Shelia Hoar Zahm. Occupational Studies Section, Environ Health Perspect. 1995 Nov; 103 (Suppl 8): 205–208.
6. <http://www3.epa.gov/pm/>. Accessed February 23, 2016.
7. CAFOs and Public Health: Emissions and the Respiratory Health of Neighbors. Wall, Samantha & Ebner, Paul. Purdue University. November, 2007.
8. CAFOs and Public Health: Odor and its Possible Health Effects. Ebner, Paul. Purdue University. March, 2008.
9. Network of Care. Wicomico County Local Health Improvement Process. <http://dhmh.maryland.gov/SHIP/Pages/home.aspx>. Accessed February 25, 2016.
10. School Proximity to Concentrated Animal Feeding Operations and Prevalence of Asthma in Students. Sigurdur T. Sigurdarson and Joel N. Kline. *Chest* 2006;129;1486-1491.
11. Windbreak Plant Species for Odor Management around Poultry Production Facilities. Maryland Plant Materials Technical Note No. 1. Belt, S.V., M. van der Grinten, G. Malone, P. Patterson and R. Shockey. USDA-NRCS National Plant Materials Center, Beltsville, MD.
12. Maryland Coastal Plain Aquifer Information System: Hydrogeologic Framework. Anderson, David, Staley, Andres, Achmad, Grufon. Open File Report No. 12-02-20. 2013.
13. Hydrogeology and simulation of ground-water flow in the upper Wicomico River Basin and estimation of contributing areas of the City of Salisbury well fields, Wicomico County, Maryland. 1997, Andreasen, D.C. and Smith, B.S. Report of Investigations No. 65.
14. Occurrence and Distribution of Enteric Viruses in Shallow Ground Water and Factors Affecting Well Vulnerability to Microbiological Contamination in Worcester and Wicomico Counties, Maryland. Banks, W., Battigelli, D., Klohe, C.. Water-Resources Investigations Report 01-4147. 2001.
15. Source Water Protection Program Benefiting the City of Salisbury Water System (PWSID 022-0004). Wicomico County, Maryland. August 8, 2013.
16. Contained Animal Feeding Operations — Insect Considerations Purdue University. <https://www.extension.purdue.edu/extmedia/ID/cafo/ID-353.pdf>. Accessed February 29, 2016.

ATTACHMENTS

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CENTER FOR A LIVABLE FUTURE
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January 22, 2016

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Disclaimer: The opinions expressed herein are our own and do not necessarily reflect the views of The Johns Hopkins University.

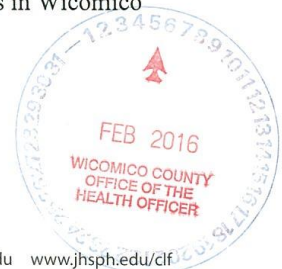
To Whom It May Concern:

We are researchers at The Johns Hopkins Center for a Livable Future, based at the Bloomberg School of Public Health in the Department of Environmental Health Sciences. The Center engages in research, policy analysis, education, and other activities guided by an ecologic perspective that diet, food production, the environment, and public health are interwoven elements of a complex system. We recognize the prominent role that food animal production plays regarding a wide range of public health issues surrounding that system.

Below, we summarize the peer-reviewed scientific literature on the human health concerns associated with industrial broiler production, a model characterized in part by specialized operations designed for a high rate of production and large numbers of broilers confined at high density. This information is highly relevant to Wicomico County, because in 2012 the county had an inventory of 11 million broilers – the fourth largest of any county in Maryland (1). In 2012, there were 110 broiler operations in the county, 76 of which sold between 200,000-499,999 birds per operation, and 35 of which sold over 500,000 broilers per operation (1). Wicomico is adjacent to counties with the largest (Somerset) and second largest (Worcester) broiler inventories in the state (1).

We are writing to present the known human health concerns associated with industrial broiler production, focusing on those that may affect citizens living near broiler operations in Wicomico County.

Human health concerns associated with industrial broiler production include:



- Infections resulting from the potential transmission of harmful microorganisms from broiler operations to nearby residents, for example, via flies or contaminated air and water;
- Health effects, including asthma, bronchitis, allergic reactions, associated with exposures to air pollution from broiler operations;
- Health effects (e.g. thyroid problems, methemoglobinemia, neurological impairments, liver damage) associated with exposures to nitrates, drug residues, and other hazards that may be present in ground and/or surface waters contaminated by manure from broiler operations.

Disease transmission

Crowded conditions in industrial broiler operations present opportunities for the transmission of bacterial pathogens among animals, and between animals and humans (2). Human exposure to infectious agents can occur through multiple routes, including breathing contaminated air and drinking contaminated water (3-7).

Of additional concern is exposure to pathogens that are resistant to antibiotics used in human medicine. The non-medicinal use of antibiotic drugs as a means for growth promotion¹ in animals has become commonplace—an estimated 80 percent of antibiotics sold for human and animal uses in the U.S. are sold for use in food-producing animals (8). Administering antibiotics to animals at levels too low to treat disease fosters the proliferation of antibiotic-resistant pathogens. Resistant infections in humans are more difficult and expensive to treat (9) and more often fatal (10) than infections with non-resistant strains.

A growing body of evidence provides support that pathogens can be found in and around broiler operations. In broiler operations that administer antibiotics for non-therapeutic purposes, broilers have been shown to be carriers of antibiotic-resistant pathogens (11-14) and these resistant pathogens have also been found in the environment in and around broiler production facilities, specifically in the litter (15), flies (16), and manure (17). Additionally, *Salmonella* and *Campylobacter* are highly prevalent among U.S. broilers, and *Campylobacter* is found in about 50% of manure samples (18). *Campylobacter* infections in people have led to gastrointestinal illness, neuromuscular paralysis, and arthritis (18).

Several studies have shown that workers in broiler operations are disproportionately exposed to pathogens: in a Dutch study, 5.6% of broiler workers were carriers of methicillin-resistant *Staphylococcus aureus* (MRSA) (19) vs. 0.01% of the general population, and broiler workers on

¹ U.S. Food and Drug Administration (FDA) voluntary industry guidelines continue to endorse the use of antibiotics in livestock production for “disease prevention”, which allows for dosing that is largely indistinguishable from growth promotion, thus tolerating business as usual (40).

the Delmarva Peninsula were found to have 32 times the odds of carrying gentamicin-resistant *E. coli* compared with other residents in the community (3). Colonized or infected workers may transport pathogens into their communities (3).

Manure runoff from broiler operations may introduce harmful microorganisms, such as *Campylobacter* (17), into nearby water sources. Land application of broiler manure may present an opportunity for pathogens contained in the manure to leach into the ground or run off into recreational water and drinking water sources, potentially causing a waterborne disease outbreak (17).

People living near broiler operations may be exposed to harmful microorganisms, which have been found to be spread in the air up to 3,000 meters from broiler operations (4). The shape and spread of this airflow varies with changes in wind patterns, making it difficult to predict which residents might be most affected (4). Still, infectious agents have been found on deposits of particulate matter several miles from operations (4). Harmful bacteria such as *Campylobacter* have been reported to enter and leave poultry operations via insects and massive ventilation systems (6). One study on Maryland's Eastern Shore found that current methods of transporting chickens in open-air trucks releases microorganisms into the surrounding environment, likely exposing nearby residents to these pathogens (7).

The elevated presence of flies near broiler operations can be more than just a nuisance; it also may facilitate residents' exposure to pathogens, including antibiotics-resistant strains of *Enterococci* and *Staphylococci* (6, 16). One study found that residences within 0.5 mile of broiler operations were found to have 83 times the average number of flies of control households (19).

Air pollution from broiler operations

The air inside broiler operations contains elevated concentrations of gases, particulate matter, pathogens, endotoxins, and other hazards (5, 6, 16, 20-22). Airborne contaminants from broiler operations are transported from broiler houses through large exhaust fans and may pose a health risk to nearby residents (4, 6, 17, 23-28). Ammonia (29), particulate matter (17), endotoxins (27), and microorganisms (4, 6, 17) have been detected in air samples surrounding poultry operations. While there are currently few data available on odor, nitrous oxide, hydrogen sulfide, and non-methane volatile organic compound levels surrounding poultry operations, odors associated with air pollutants from intensive livestock hog operations have been shown to interfere with daily activities, quality of life, social gatherings, and community cohesion (25, 30, 31).

Exposure to airborne contaminants from broiler operations has been associated with a range of adverse health effects. Ammonia emissions have been implicated in respiratory health, with up to 50% of poultry workers suffering from upper respiratory illnesses that are believed to be due to ammonia exposure (23). Studies have shown that endotoxin exposure can exacerbate pre-existing

asthma or induce new cases of asthma, and exposure was found to be a significant predictor of chronic phlegm for poultry workers (25, 32). Particulate matter—consisting mainly of down feathers, mineral crystals from urine, and poultry litter in broiler operations—may also have detrimental effects on human health, causing chronic cough and phlegm, chronic bronchitis, allergic reactions, and asthma-like symptoms in farmers, and respiratory problems in people living in the vicinities of operations (27). Additionally, poultry workers demonstrated a high prevalence of obstructive pulmonary disorders, with increasing prevalence associated with longer exposure, regardless of smoking status (26).

A 2010 USDA study measured volatile organic compounds (VOCs) inside industrial broiler operations and found that close to 70% of VOCs included acetic acid, 2,3-butanedione, methanol, acetone, and ethanol (33); similar studies have not been conducted outside of broiler operations, and would help to characterize nearby residents' exposure to VOCs. It is important to note that even industrial broiler operations that employ best management practices and mitigation techniques have been shown to generate airborne contaminants (24).

Contaminated ground and surface water

Manure from broiler operations may contain nutrients, heavy metals, drug residues, and pathogens that can leach into groundwater or runoff into surface water (5, 28, 19, 34, 35). Studies have demonstrated that humans can be exposed to waterborne contaminants from livestock and poultry operations through the recreational use of contaminated surface water and the ingestion of contaminated drinking water (22, 35). Furthermore, the disposal and decomposition of diseased poultry carcasses may contaminate water sources and pose a threat to human health (19).

The nutrients nitrogen and phosphorus--naturally occurring in chicken manure--have been found in both ground and surface water near Maryland broiler chicken operations (36) and can have deleterious effects on water quality and human health (17, 19, 22, 26, 35, 37-39). A University of Maryland Eastern Shore pilot study found that 67% of private wells—which residents are responsible for testing and maintaining—failed to meet drinking water standards for total coliform, 36% tested positive for *E. coli*, and 31% failed the standards for total dissolved solids and pH (40). In one study, broiler chicken and corn production were associated with higher nitrate concentrations (naturally occurring in manure) in drinking water in Maryland wells (37). Ingesting high levels of nitrate has been associated with increased risks for thyroid conditions (22, 41, 42), birth defects and other reproductive problems (22, 42, 43), diabetes (22, 42), various cancers (42, 44), and methemoglobinemia (blue baby syndrome), a potentially fatal condition among infants (22, 45). Approximately 60,000 Wicomico County residents rely on private wells for drinking water (46), so there is cause for concern regarding the spread of nitrate into groundwater drinking sources.

Nutrient runoff has also been implicated in the growth of harmful algal blooms (17, 19, 38, 47), which may pose health risks for people who swim or fish in recreational waters, or who consume contaminated seafood. Exposure to algal toxins (such as the toxic dinoflagellate, *Pfiesteria piscicida*) has been linked to neurological impairments, liver damage, stomach illness, skin lesions, and other adverse health effects (38, 39, 48).

Finally, there may be health risks associated with exposure to drug residues and excreted hormones found in chicken manure-contaminated ground and surface water. Of particular concern is estradiol, which is naturally found at high levels in chicken manure and is an endocrine-disruptor in humans (49). Environmental estrogens such as estradiol may be linked to increased incidence of male reproductive tract disorders, reduced sperm counts, and increases in the frequency of female breast cancer (49). Estradiol has been found in Chesapeake Bay tributaries in levels high enough to induce estrogenic effects on aquatic organisms (19, 49). Increasing the number of chickens produced in the bay's tributaries would likely increase the amount of estradiol entering the bay through manure runoff, thereby increasing the potential for endocrine-disruption in humans through water-borne estradiol exposure.

Conclusion

A growing body of evidence has implicated industrial broiler production in the spread of infectious diseases (including antibiotic-resistant strains), the generation and spread of airborne contaminants, and the contamination of ground and surface waters. We hope our letter is helpful in describing some of the public health concerns associated with the potential expansion of broiler operations in Wicomico County. Through our research, we know that health departments face many barriers addressing issues surrounding industrial farm animal production (50, 51), and we are prepared to serve as a resource to your offices. Please do not hesitate to contact us if you have any questions.

Sincerely,

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References

1. United States Department of Agriculture Census of Agriculture. (2012). *Poultry—Inventory and Sales 2007 and 2012*. Washington, D.C.: National Agricultural Statistics Service. Retrieved from http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1_Chapter_2_County_Level/Maryland/
2. Gomes, A. V. S., Quinteiro-Filho, W. M., Ribeiro, A., Ferraz-de-Paula, V., Pinheiro, M. L., Baskeville, E., ... Palermo-Neto, J. (2014). Overcrowding stress decreases macrophage activity and increases *Salmonella* Enteritidis invasion in broiler chickens. *Avian Pathology: Journal of the W.V.P.A.*, 43(1), 82–90. doi:10.1080/03079457.2013.874006
3. Price, L. B., Graham, J. P., Lackey, L. G., Roess, A., Vailes, R., & Silbergeld, E. (2007). Elevated risk of carrying gentamicin-resistant *Escherichia coli* among U.S. poultry workers. *Environmental Health Perspectives*, 115(12), 1738–1742. doi:10.1289/ehp.10191
4. Baykov, B., & Stoyanov, M. (1999). Microbial air pollution caused by intensive broiler chicken breeding. *FEMS Microbiology Ecology*, 29, 389–392. doi:10.1016/S0168-6496(99)00033-1
5. Spencer, J. L., & Guan, J. (2004). Public health implications related to spread of pathogens in manure from livestock and poultry operations. *Methods in molecular biology (Clifton, N.J.)*, 268, 503–515. doi:10.1385/1-59259-766-1:503
6. Graham, J. P., Leibler, J. H., Price, L. B., Otte, J. M., Pfeiffer, D. U., Tiensin, T., & Silbergeld, E. K. (2008). The Animal-Human Interface and Infectious Disease in Industrial Food Animal Production: Rethinking Biosecurity and Biocontainment. *Public health reports*, 123, 282–299
7. Rule, A. M., Evans, S. L., & Silbergeld, E. K. (2008). Food animal transport: A potential source of community exposures to health hazards from industrial farming (CAFOs). *Journal of Infection and Public Health*, 1, 33–39. doi:10.1016/j.jiph.2008.08.001
8. U.S. Food and Drug Administration. Letter to The Honorable Louise M. Slaughter: Sales of Antibacterial Drugs in Kilograms. Washington D.C.; 2010.
9. Roberts RR, Hota B, Ahmad I, Scott RD, Foster SD, Abbasi F, et al. Hospital and societal costs of antimicrobial-resistant infections in a Chicago teaching hospital: implications for antibiotic stewardship. *Clin Infect Dis An Off Publ Infect Dis Soc Am*. 2009 Oct 15;49(8):1175–84.
10. Filice GA, Nyman JA, Lexau C, Lees CH, Bockstedt LA, Como-Sabetti K, et al. Excess costs and utilization associated with methicillin resistance for patients with *Staphylococcus aureus* infection. *Infect Control Hosp Epidemiol*. 2010;31(4):365–73.
11. Davis, M. F., Price, L. B., Liu, C. M. H., & Silbergeld, E. K. (2011). An ecological perspective on U.S. industrial poultry production: The role of anthropogenic ecosystems on the emergence of drug-resistant bacteria from agricultural environments. *Current Opinion in Microbiology*, 14, 244–250. doi:10.1016/j.mib.2011.04.003
12. Smith, J. L., Drum, D. J. V., Dai, Y., Kim, J. M., Sanchez, S., Maurer, J. J., ... Lee, M. D. (2007). Impact of antimicrobial usage on antimicrobial resistance in commensal *Escherichia coli* strains colonizing broiler chickens. *Applied and Environmental Microbiology*, 73(5), 1404–1414. doi:10.1128/AEM.01193-06

13. Price, L. B., Lackey, L. G., Vailes, R., & Silbergeld, E. (2007). The persistence of fluoroquinolone-resistant *Campylobacter* in poultry production. *Environmental Health Perspectives*, 115(7), 1035–1039. doi:10.1289/ehp.10050
14. Siemon, C. E., Bahnson, P. B., & Gebreyes, W. a. (2007). Comparative investigation of prevalence and antimicrobial resistance of *Salmonella* between pasture and conventionally reared poultry. *Avian Diseases*, 51(1), 112–117. doi:10.1637/1933-5334(2007)2[e17:CIOPAA]2.0.CO;2
15. Graham, J. P., Evans, S. L., Price, L. B., & Silbergeld, E. K. (2009). Fate of antimicrobial-resistant enterococci and staphylococci and resistance determinants in stored poultry litter. *Environmental Research*, 109(6), 682–689. doi:10.1016/j.envres.2009.05.005
16. Graham, J. P., Price, L. B., Evans, S. L., Graczyk, T. K., & Silbergeld, E. K. (2009). Antibiotic resistant enterococci and staphylococci isolated from flies collected near confined poultry feeding operations. *Science of the Total Environment*, 407(8), 2701–2710. doi:10.1016/j.scitotenv.2008.11.056
17. EPA. (2013). Literature review of contaminants in livestock and poultry manure and implications for water quality, (July), 1–137. doi:EPA 820-R-13-002
18. Mulders, M. N., Haenen, a P. J., Geenen, P. L., Vesseur, P. C., Poldervaart, E. S., Bosch, T., ... Van De Giessen, a W. (2010). Prevalence of livestock-associated MRSA in broiler flocks and risk factors for slaughterhouse personnel in The Netherlands. *Epidemiology and Infection*, 138, 743–755. doi:10.1017/S0950268810000075
19. Gerber, P., Opio, C., Steinfeld, H. (2008). Poultry production and the environment: a review. Animal Production and Health Division, Food and Agriculture Organization of the United Nations. Available online at: http://www.fao.org/Ag/Againfo/home/events/bangkok2007/docs/part2/2_2.pdf
20. Donham, K. J., Wing, S., Osterberg, D., Flora, J. L., Hodne, C., Thu, K. M., & Thorne, P. S. (2007). Community health and socioeconomic issues surrounding concentrated animal feeding operations. *Environmental Health Perspectives*, 115, 317–320. doi:10.1289/ehp.8836
21. Kirychuk, S. P., Dosman, J. A., Reynolds, S. J., Willson, P., Senthilselvan, A., Feddes, J. J. R., ... Guenter, W. (2006). Total dust and endotoxin in poultry operations: comparison between cage and floor housing and respiratory effects in workers. *Journal of occupational and environmental medicine / American College of Occupational and Environmental Medicine*, 48, 741–748. doi:10.1097/01.jom.0000216215.39521.3c
22. Burkholder, J., Libra, B., Weyer, P., Heathcote, S., Kolpin, D., Thorne, P. S., & Wichman, M. (2007). Impacts of waste from concentrated animal feeding operations on water quality. *Environmental Health Perspectives*, 115, 308–312. doi:10.1289/ehp.8839
23. Nahm, K. H. (2005). Environmental Effects of Chemical Additives Used in Poultry Litter and Swine Manure. *Critical Reviews in Environmental Science and Technology*. doi:10.1080/10643380590966208
24. Rice, J. M., Caldwell, D. F., Humenik, F. J., (Eds.). (2006). Animal Agriculture and the Environment: National Center for Manure and Animal Waste Management White Papers, ASABE: Publ. Number 913C0306, St. Joseph, MI.
25. Heederik, D., Sigsgaard, T., Thorne, P. S., Kline, J. N., Avery, R., Bønløkke, J. H., ... Merchant, J. A. (2007). Health effects of airborne exposures from concentrated animal feeding operations. *Environmental Health Perspectives*, 115, 298–302. doi:10.1289/ehp.8835

26. Viegas, S., Faisca, V. M., Dias, H., Clérigo, a, Carolino, E., & Viegas, C. (2013). Occupational exposure to poultry dust and effects on the respiratory system in workers. *Journal of toxicology and environmental health. Part A*, 76, 230–9. doi:10.1080/15287394.2013.757199
27. Cambra-Lopez, M., Aarnink, A. J., Zhao, Y., Calvet, S., & Torres, A. G. (2010). Airborne particulate matter from livestock production systems: a review of an air pollution problem. *Environ Pollut*, 158, 1–17. doi:S0269-7491(09)00350-9 [pii]r10.1016/j.envpol.2009.07.011
28. Graham, J. P., & Nachman, K. E. (2010). Managing waste from confined animal feeding operations in the United States: The need for sanitary reform. *Journal of Water and Health*. doi:10.2166/wh.2010.075
29. Fairchild, B. D., Czarick, M., Harper, L.A., Worley, J.W., Ritz, C.W., Hale, B.W. (2009). Ammonia concentrations downstream of broiler operations. *Journal of Applied Poultry Research* (3), 630-639. doi: 10.3382/japr.2008-00126
30. Donham, K. J., Wing, S., Osterberg, D., Flora, J. L., Hodne, C., Thu, K. M., & Thorne, P. S. (2007). Community health and socioeconomic issues surrounding concentrated animal feeding operations. *Environmental Health Perspectives*, 115, 317–320. doi:10.1289/ehp.8836
31. Wing, S., & Wolf, S. (2000). Intensive livestock operations, health, and quality of life among eastern North Carolina residents. *Environmental Health Perspectives*, 108, 233–238. doi:10.1289/ehp.00108233
32. Kirychuk, S. P., Dosman, J. A., Reynolds, S. J., Willson, P., Senthilselvan, A., Feddes, J. J. R., ... Guenter, W. (2006). Total dust and endotoxin in poultry operations: comparison between cage and floor housing and respiratory effects in workers. *Journal of occupational and environmental medicine / American College of Occupational and Environmental Medicine*, 48, 741–748. doi:10.1097/01.jom.0000216215.39521.3c
33. Trabue, S., Scoggin, K., Li, H., Burns, R., Xin, H., & Hatfield, J. (2010). Speciation of volatile organic compounds from poultry production. *Atmospheric Environment*, 44, 3538–3546. doi:10.1016/j.atmosenv.2010.06.009
34. Nachman, K. E., Graham, J. P., Price, L. B., & Silbergeld, E. K. (2005). Arsenic: A roadblock to potential animal waste management solutions. *Environmental Health Perspectives*, 113, 1123–1124. doi:10.1289/ehp.7834
35. Edwards, D. R., & Daniel, T. C. (1992). Environmental impacts of On-Farm poultry waste disposal. A review. *Bioresource Technology*. doi:10.1016/0960-8524(92)90094-E
36. Beckert, K. A., Fisher, T. R., & Oapos;Neil, J. M., & Jesien, R. V. (2011). Characterization and comparison of stream nutrients, land use, and loading patterns in Maryland coastal bay watersheds. *Water, Air, and Soil Pollution*, 221, 255–273. doi:10.1007/s11270-011-0788-7
37. Lichtenberg, E., & Shapiro, L. K. (1997). Agriculture and Nitrate Concentrations in Maryland Community Water System Wells. *Journal of Environment Quality*. doi:10.2134/jeq1997.00472425002600010022x
38. Heisler, J., Glibert, P. M., Burkholder, J. M., Anderson, D. M., Cochlan, W., Dennison, W. C., ... Suddleson, M. (2008). Eutrophication and harmful algal blooms: A scientific consensus. *Harmful Algae*, 8, 3–13. doi:10.1016/j.hal.2008.08.006

39. Dolah, F. M. Van, Roelke, D., & Greene, R. M. (2001). Health and Ecological Impacts of Harmful Algal Blooms: Risk Assessment Needs. *Human and Ecological Risk Assessment: An International Journal*. doi:10.1080/20018091095032
40. Cotton, C., Clemens, S. (2010). Safe drinking water clinics: education homeowners on the Eastern Shore of Delmarva. Abstract retrieved from <http://usawaterquality.org/conferences/2010/PDFs/Cotton.pdf>
41. Aschebrook-Kilfoy, B., Heltsh, S. L., Nuckols, J. R., Sabra, M. M., Shuldiner, A.R., Mitchell, B.D., et al. (2012) Modeled nitrate levels in well water supplies and prevalence of abnormal thyroid conditions among the Old Order Amish in Pennsylvania. *Environmental Health* 11 (1):6.
42. Ward, M. H. (2009). Too Much of a Good Thing? Nitrate from Nitrogen Fertilizers and Cancer. *Reviews on Environmental Health*. doi:10.1515/REVEH.2009.24.4.357
43. Manassaram, D. M., Backer, L. C., & Moll, D. M. (2006). A review of nitrates in drinking water: Maternal exposure and adverse reproductive and developmental outcomes. *Environmental Health Perspectives*. doi:10.1289/ehp.8407
44. Chiu, H.-F., Tsai, S.-S., & Yang, C.-Y. (2007). Nitrate in drinking water and risk of death from bladder cancer: an ecological case-control study in Taiwan. *Journal of toxicology and environmental health. Part A*, 70, 1000–1004. doi:10.1080/15287390601171801
45. Knobeloch, L., Salna, B., Hogan, A., Postle, J., & Anderson, H. (2000). Blue babies and nitrate-contaminated well water. *Environmental Health Perspectives*, 108, 675–678. doi:10.1289/ehp.00108675
46. United States Geological Survey (USGS). (2015, Feb 18). *USGS Water Use Data for the Nation*. Retrieved February 18, 2015 from <http://waterdata.usgs.gov/nwis/wu>.
47. Anderson, D. M., Burkholder, J. M., Cochlan, W. P., Glibert, P. M., Gobler, C. J., Heil, C. A., ... Vargo, G. A. (2008). Harmful algal blooms and eutrophication: Examining linkages from selected coastal regions of the United States. *Harmful Algae*, 8, 39–53. doi:10.1016/j.hal.2008.08.017
48. Van Dolah, F. M. (2000). Marine algal toxins: Origins, health effects, and their increased occurrence. *Environmental Health Perspectives*. doi:10.1289/ehp.00108s1143
49. Dorabawila, N., & Gupta, G. (2005). Endocrine disrupter--estradiol--in Chesapeake Bay tributaries. *Journal of hazardous materials*, 120, 67–71. doi:10.1016/j.jhazmat.2004.12.031
50. Fry, J. P., Laestadius, L. I., Grechis, C., Nachman, K. E., & Neff, R. A. (2013). Investigating the Role of State and Local Health Departments in Addressing Public Health Concerns Related to Industrial Food Animal Production Sites. *PLoS ONE*, 8. doi:10.1371/journal.pone.0054720
51. Fry, J. P., Laestadius, L. I., Grechis, C., Nachman, K. E., & Neff, R. A. (2014). Investigating the role of state permitting and agriculture agencies in addressing public health concerns related to industrial food animal production. *PLoS ONE*, 9. doi:10.1371/journal.pone.0089870



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FOR IMMEDIATE RELEASE - March 29, 2016

EXECUTIVE CULVER STATEMENT ON RESULTS OF POULTRY FORUM

In recent months, Wicomico County has experienced an increase in the development of large scale chicken houses known as CAFOs (concentrated animal feeding operations). Many county residents have expressed concern over health and environmental impact as well as economic impact on their property, both residential and commercial.

With so much misinformation and misconceptions being circulated, we felt it was in everyone's best interest to assemble a panel of experts to address the issues. Working with the office of Governor Hogan to secure the most knowledgeable people in the State, we were able to schedule the forum for March 22nd at the Wicomico Civic Center. Responsible parties from the Maryland Departments of Agriculture, Environment and Health & Mental Hygiene, in addition to several local representatives, answered questions, many submitted in writing by the more than 500 citizens in attendance. Almost all the panel members were from agencies within the Maryland departments that are responsible for regulating, permitting and inspecting CAFOs.

While emotions were high and those who adamantly oppose CAFOs picketed outside, we were pleased that the audience was respectful of the panel members and each other. For nearly two hours, the health and protection of the Paleo Channel was discussed along with waste management and potential health risks.

Significant points made by the panel included:

- The U.S. Environmental Protection Agency has set very protective standards for levels of nitrates in water. These standards are implemented by the State of Maryland through regulation, permitting and inspection.
- Storage of waste, including the chicken housing, are “under roof”, meaning rain water does not reach the waste to cause run-off.
- Properly permitted and maintained poultry operations produce less effect on the environment than run-off from fertilized lawns.
- Compliance is key. If permits are adhered to, there will be no discharge of waste in excess of the nutrient management plan.
- Field crops use significantly more water than poultry houses.
- The Department of Health & Mental Hygiene finds there is no significant evidence that poultry workers have increased health issues from exposure to chicken houses.
- The aquifers in Wicomico County are among the best in the State. Water levels have stayed consistent since the 1960s and the “recharge” nature provides is adequate.

Areas that need further discussion and examination are:

- Permitting process – It is important that those who plan to build CAFOs apply for a CAFO permit in the beginning of the process and not at the end. One presenter suggested that the CAFO permit be the first one applied for and then work backwards from there.
- Inspections – Inspections are conducted every 5 years or if a complaint is received. Should more frequent inspections be considered?
- Health/Environment – There are currently no standards or testing for particles emitted from chicken house exhaust fans. However, odors and particles are of some concern with regards to asthma. It is hard to quantify because each individual is different and everyone is not affected. Currently, there is not enough known by DHMH to set any standards for CAFO construction. However, consideration should be given to location of houses in relationship to residential homes.

At the conclusion of the forum, I personally felt there were adequate regulations in place to protect the Paleo Channel and other aquifers. I am aware that there is data that may say otherwise. It is a question of whose data do you trust and whose data is being used by authorities to make their decisions. Let’s remember that opposing data can be found for almost any subject you want to name.

My real take away from the forum, however, was when a zoning question was asked or the panel referred to something as a “zoning issue”, it drew the most audience applause. At the end of the day, I believe that is the true concern of

our citizens. No one wants a CAFO within view or “smell” of their homes or businesses. It boils down to economic impact.

We must recognize that economic impact cuts both ways. Wicomico County has and continues to reap enormous economic benefits from the poultry industry through employment, taxes and support of local businesses. Even the social fabric of our county has been improved by the generosity of poultry families to Salisbury University, WorWic Community College, Peninsula Regional Medical Center and so much more. Wicomico County cannot afford to have the poultry industry leave.

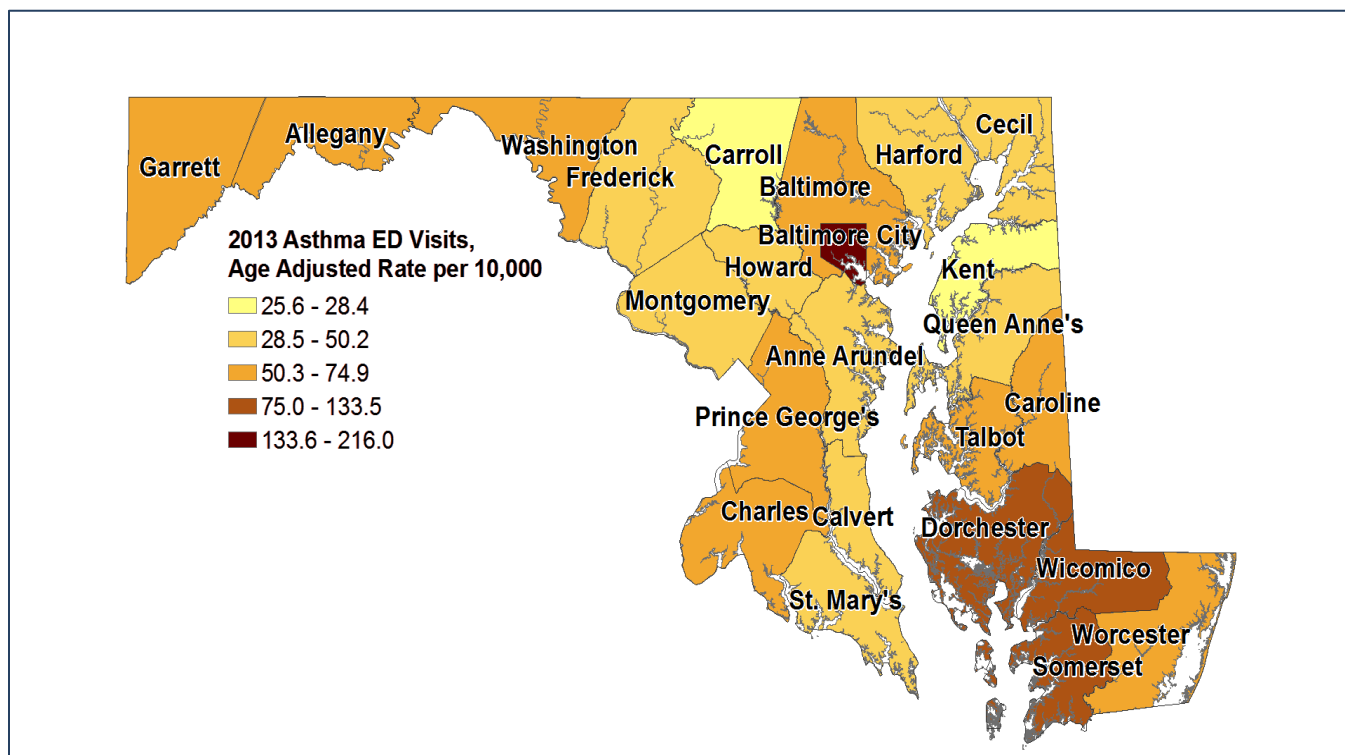
At the same time, we cannot let our home values and residential and commercial property values decline. Investors will not want to develop new businesses close to CAFOs and home owners will lose equity, both resulting in lower tax revenues to sustain the County.

So, what do we do? It is up to the Wicomico County Council to develop a balanced approach to our zoning laws, so all can find a way to prosper. Given the findings from the forum, I believe there is a pathway to find the right answer. It is what our friends in the poultry industry deserve as well as our taxpayers.

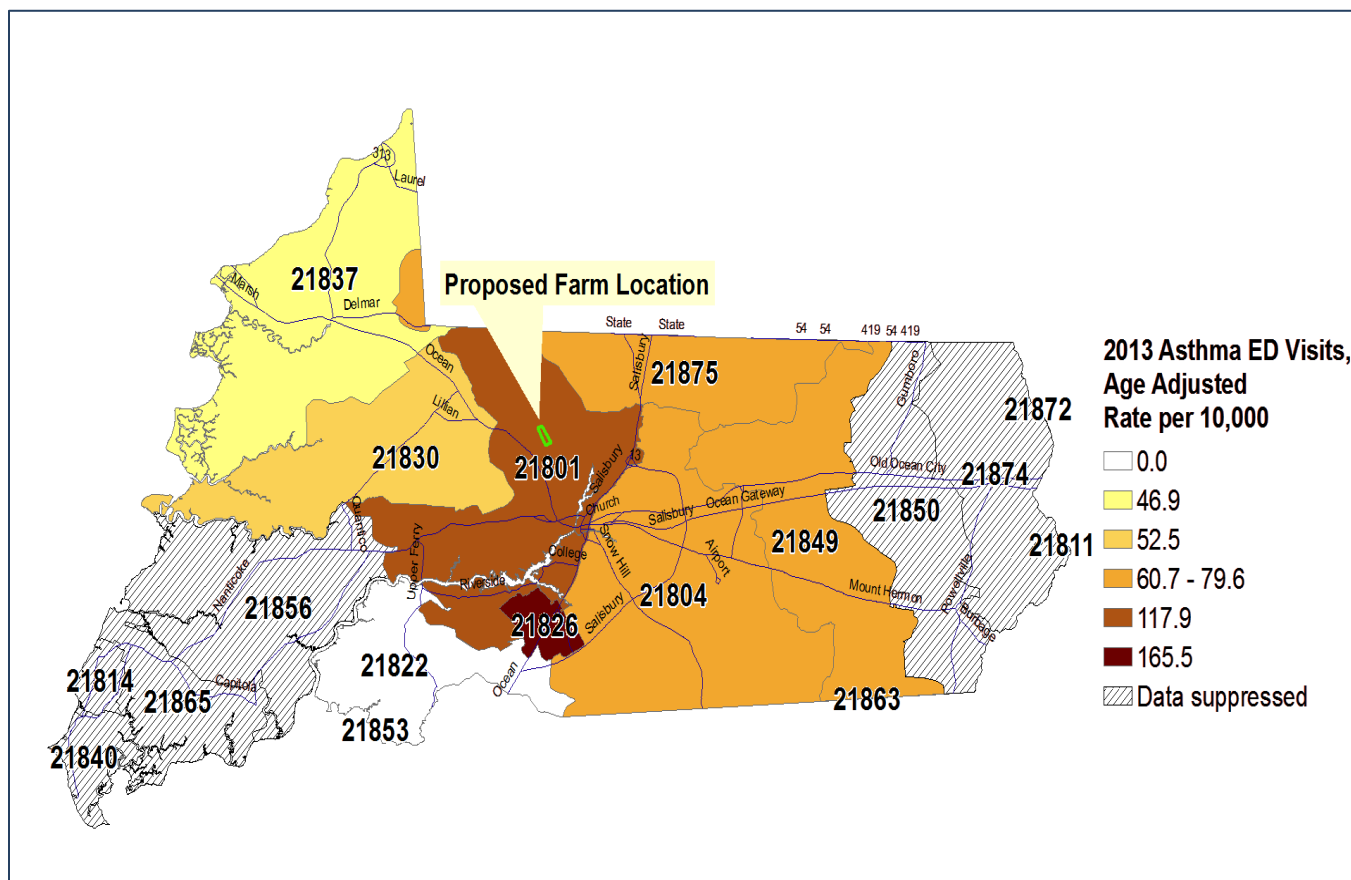
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APPENDICES

A. 2013 Maryland Asthma Emergency Department Visits



B. 2013 Wicomico Asthma Emergency Department Visits



C. 2009 Wicomico All-Cause Mortality

